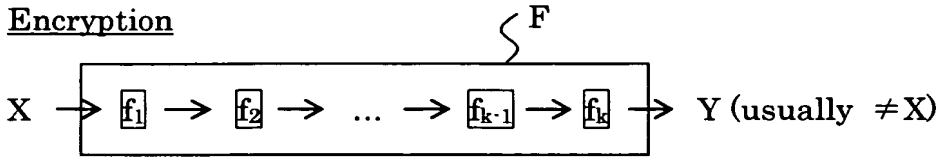
DIAGRAM

[Shimizu et al.]

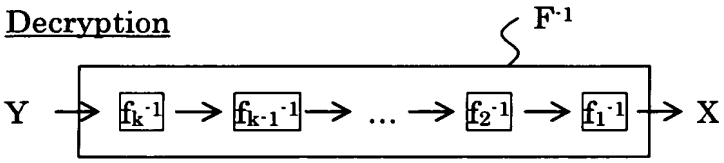
Encryption



$F = f_k \cdot f_{k-1} \cdot \ldots \cdot f_2 \cdot f_1$

$Y = F(X) = f_k \cdot f_{k-1} \cdot \ldots \cdot f_2 \cdot f_1 (X)$

Decryption



$F^{-1} = f_1^{-1} \cdot f_2^{-1} \cdot \ldots \cdot f_{k-1}^{-1} \cdot f_k^{-1}$

$X = F^{-1}(Y) = f_1^{-1} \cdot f_2^{-1} \cdot \ldots \cdot f_{k-1}^{-1} \cdot f_k^{-1} (Y)$

If f is an involution type, i.e., $f_k^{-1} = f_k$, $f_{k-1}^{-1} = f_{k-1}$, ..., $f_2^{-1} = f_2$, ..., $f_1^{-1} = f_1$,

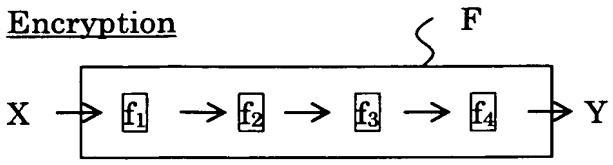
$F^{-1} = f_1 \cdot f_2 \cdot \ldots \cdot f_{k-1} \cdot f_k$

$X = F^{-1}(Y) = f_1 \cdot f_2 \cdot \ldots \cdot f_{k-1} \cdot f_k (Y)$

DIAGRAM

[Present Invention]

Encryption



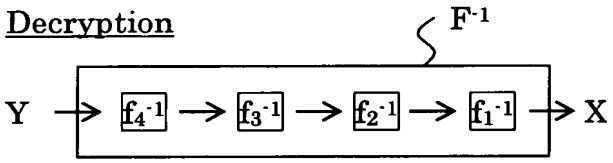
$F = f_4 \cdot f_3 \cdot f_2 \cdot f_1$

$Y = F(X) = f_4 \cdot f_3 \cdot f_2 \cdot f_1(X)$

If $f_4 = f_1^{-1}$ and $f_3 = f_2^{-1}$, $f_2^{-1} \cdot f_2 = 1$ and $f_1^{-1} \cdot f_1 = 1$

$Y = F(X) = f_4 \cdot f_3 \cdot f_2 \cdot f_1(X) = f_1^{-1} \cdot f_2^{-1} \cdot f_2 \cdot f_1(X) = f_1^{-1} \cdot f_1(X) = X$

Decryption



$F^{-1} = f_1^{-1} \cdot f_2^{-1} \cdot f_3^{-1} \cdot f_4^{-1}$

$X = F^{-1}(Y) = f_1^{-1} \cdot f_2^{-1} \cdot f_3^{-1} \cdot f_4^{-1}(Y) = f_4 \cdot f_3 \cdot f_3^{-1} \cdot f_4^{-1}(Y) = f_4 \cdot f_4^{-1}(Y) = Y$